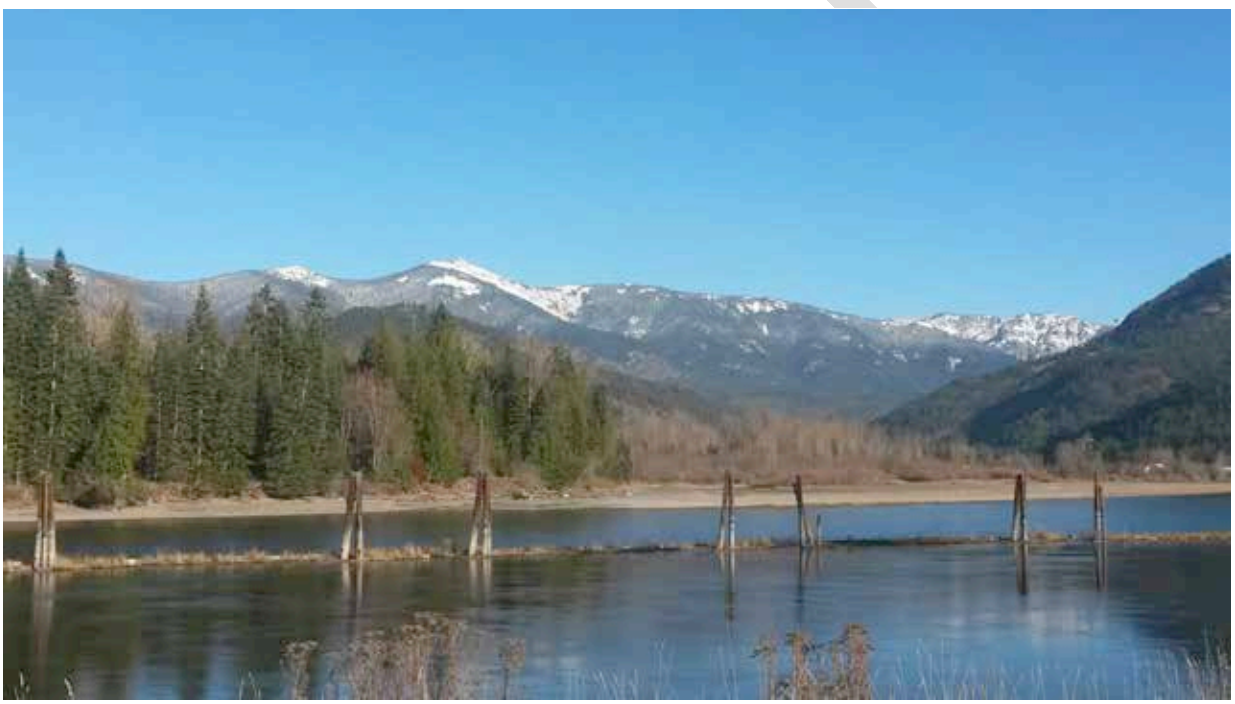
2. Flathead Valley Section

v. 2015-12-29

Section Description

The Flathead Valley, part of the Canadian Rocky Mountains Ecoregion, spans portions of Idaho, Montana, and British Columbia. The Idaho portion of the Flathead Valley, the subject of this review, comprises the northeast portion of the Idaho Panhandle from the Purcell Mountains in the north, south through the Cabinet Mountains to the Clark Fork River at its southern boundary (Fig. 2.1, 2.2). The Flathead Valley ranges from 541 to 2,141 m (1,775 to 7,024 ft) in elevation. This region is cool (average annual temperature ranges from 3.1 to 7.7 °C [37.6 to 45.9 °F]; PRISM 30-year annual temperature) and temperate and receives an annual precipitation of 61 to 234 cm (24 to 92 in; PRISM 30-year annual precipitation). Precipitation occurs mostly as snow from November to March, although rain on snow is common at lower elevations.



Cabinet Mountains © Britta Petersen 2014

A sparsely-populated mountainous region, the Flathead Valley's largest communities are Moyie Springs, Hope, and Clark Fork, each having fewer than 1,000 full-time residents. Most activity in the region originates from larger neighboring towns such as Bonners Ferry or Sandpoint. Hunting, fishing, hiking, boating, wildlife watching, and snow activities are popular in the Flathead Valley; recreation in the area continues to grow. Timber harvest and limited agriculture (e.g., nonirrigated cropland and pasture) occur within the section.

The Cabinet and Purcell mountains are the prominent landforms within the Flathead Valley. The Idaho Purcell range, the southernmost extent of the Purcell Mountains, runs 300 mi north into southeastern British Columbia. The Cabinet Mountains straddle the Idaho and Montana border with the bulk of the range in Montana. Like the neighboring Selkirk Mountains, the Purcell and Cabinet ranges in Idaho have been carved by glaciation and are influenced by a maritime climate that produces warm wet winters and cool moist summers. However, the Purcell and Cabinet ranges also periodically receive blasts of cold arctic air that characterizes a continental climate pattern. Like the Selkirk range, the topography and climate produce environmental conditions favorable to dense, diverse forests.

Dominant forest cover types within the section include mountain hemlock (*Tsuga mertensiana* [Bong.] Carrière) and Engelmann spruce (*Picea engelmannii* Parry ex Engelm.)–subalpine fir (*Abies lasiocarpa* [Hook.] Nutt.) at higher elevations; Douglas-fir (*Pseudotsuga menziesii* [Mirb.] Franco), western larch (*Larix occidentalis* Nutt.), grand fir (*Abies grandis* [Douglas ex D. Don] Lindl.), western white pine (*Pinus monticola* Douglas ex D. Don), and lodgepole pine (*Pinus contorta* Douglas ex Loudon) at middle elevations; western redcedar (*Thuja plicata* Donn ex D. Don)–western hemlock (*Tsuga heterophylla* [Raf.] Sarg.) in moister sites; and ponderosa pine (*Pinus ponderosa* Lawson & C. Lawson) at lower elevations. The diversity of forest types likewise supports a diverse assemblage of wildlife including Fisher (*Pekania pennanti*), Grizzly Bear (Ursus arctos), Moose (*Alces americanus*), and Black Swift (*Cypseloides niger*).

The Flathead Valley is intersected by several major rivers. The Moyie River divides the Purcell range in the very northeast corner of the state before flowing into the Kootenai River at Moyie Springs. The Kootenai River separates the Purcell range from both the Cabinet Mountains to the south and the Selkirk range to the West. As mentioned in the Okanogan Highlands section, patches of intact riparian habitat along the Kootenai River serve as important wildlife corridors between the 3 mountain ranges. Bounded to the south by the Clark Fork River and Lake Pend Oreille, the Cabinet Mountains sustain large streams such as Lightning Creek and Grouse Creek, which feed into the Clark Fork and Pack rivers, respectively, and ultimately into Lake Pend Oreille. Species such as Western Toad (*Anaxyrus boreas*), White Sturgeon (*Acipenser transmontanus*), Burbot (*Lota lota*), Harlequin Duck (*Histrionicus histrionicus*), and Black Swift (*Cypseloides niger*) depend upon the rivers, streams, and ponds found within the Cabinet and Purcell mountain ranges.

Conservation efforts in this section should strive to maximize the collaborative opportunities made available by the geographic proximity of Washington, British Columbia, and Montana.

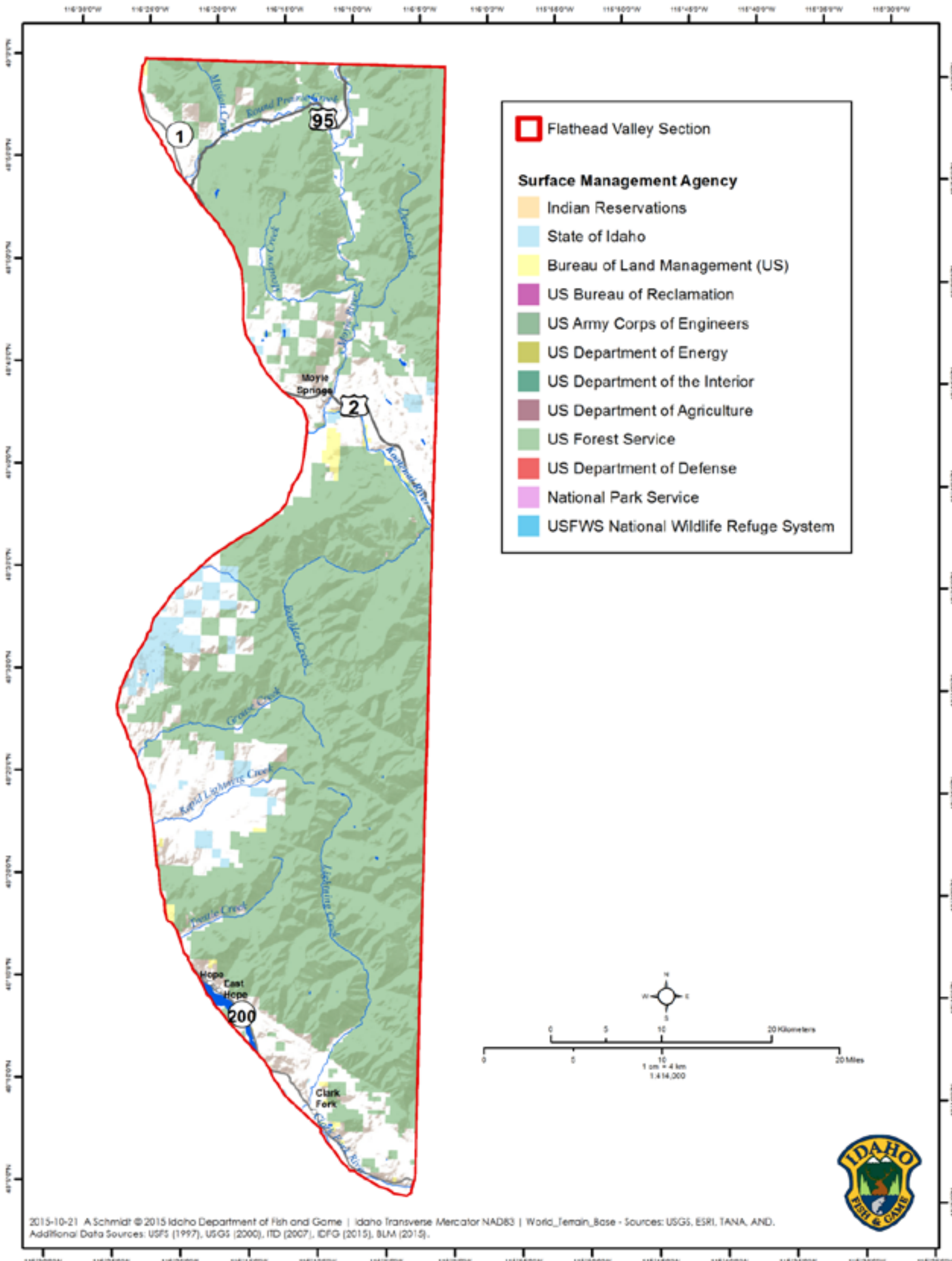


Fig. 2.1 Map of Flathead Valley surface management

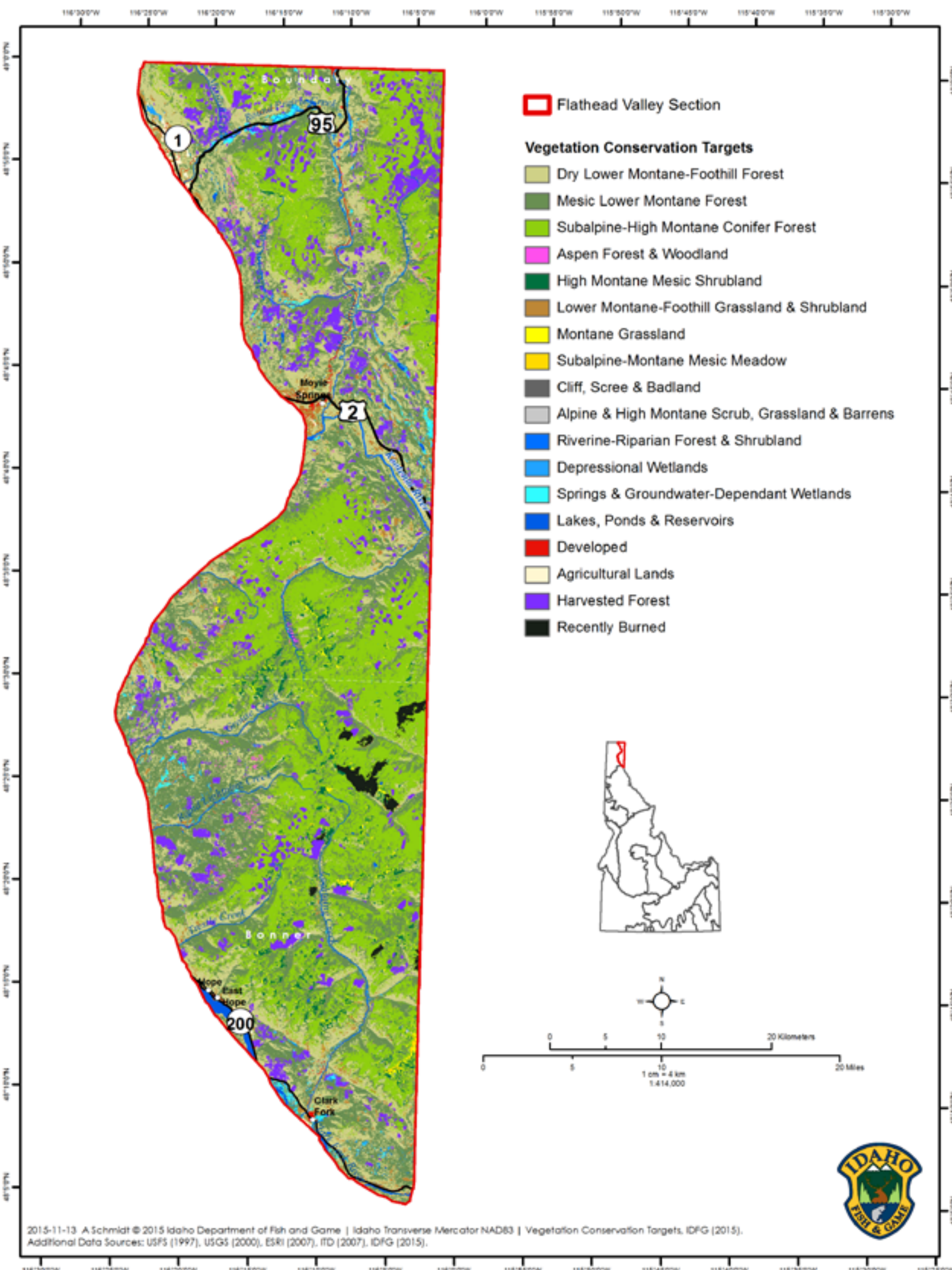


Fig. 2.2 Map of Flathead Valley vegetation conservation targets

Conservation Targets in the Flathead Valley

We selected 6 habitat targets (3 upland, 3 aquatic) that represent the major ecosystems in the Flathead Valley as shown in Table 2.1. Each of these systems provides habitat for key Species of Greatest Conservation Need (SGCN), i.e., "nested targets" (Table 2.2) associated with each target. All SGCN management programs in the Flathead Valley have a nexus with habitat management programs. Conservation of the habitat targets listed below should conserve most of the nested species within them. However, we determined that at least 6 taxonomic groups (Lake-nesting birds, Ground-dwelling invertebrates, Grizzly Bear, Pond-breeding amphibians, Low Density Forest Carnivores and Pollinators) face special conservation needs and thus are presented as explicit species targets as shown in Table 2.1.

Table 2.1 At-a-glance table of conservation targets in the Flathead Valley

Target	Target description	Target viability	Nested targets (SGCN)	
Dry Lower Montane–Foothill Forest	Northern Rocky Mts. Dry-Mesic Conifer and Ponderosa Pine Woodland and Savannah systems lower elevation forests of the Purcell and Cabinet Mountains.	*Fair*. Substantial encroachment by other habitat types due to lack of natural fire cycle	Tier 2 Tier 3	Olive-sided Flycatcher Common Nighthawk Townsend's Big-eared Bat Little Brown Myotis
Mesic Lower Montane Forest	Commonly referred to as a "cedar-hemlock" forest but also includes Lodgepole Pine and Aspen-Mixed conifer forest at lower elevations of the Purcell and Cabinet Mountains.	*Fair*. Substantial encroachment by other habitat types due to lack of natural fires cycle and loss of western white pine.	Tier 2 Tier 3	Olive-sided Flycatcher Silver-haired Bat Townsend's Big-eared Bat Little Brown Myotis
Subalpine–High Montane Conifer Forest	Dry-mesic spruce-fir forest and whitebark pine woodlands at higher elevations of the Cabinet and Purcell Mountains.	*Poor to Fair*. Subject to altered fire regimes and forest insects and disease; reduction in whitebark pine woodlands.	Tier 1 Tier 3	Wolverine Clark's Nutcracker Mountain Goat Hoary Marmot
Riverine–Riparian Forest & Shrubland	Rivers and streams, including aquatic habitats and their associated terrestrial riparian habitats. Includes Moyie River, Kootenai River, Lightening Creek, Grouse Creek and their tributaries.	*Fair*. Riverine systems in the lower valleys impacted by hydroelectric operations and invasive species. Higher elevation headwaters threatened by climate change.	Tier 1 Tier 2 Tier 3	White Sturgeon Burbot Harlequin Duck Black Swift *Ephmerella alleni* Western Ridged Mussel
Depressional Wetlands	Rain-fed systems ranging from infrequent to semi-permanent or permanently flooded. Typically pond sized or smaller. Includes	*Fair*. Lower elevations experiencing altered hydrological regimes and invasive species and disease. Higher elevations	Tier 2 Tier 3	Western Toad Northern Leopard Frog Silver-haired Bat Townsend's Big-eared Bat Little Brown Myotis

Target	Target description	Target viability	Nested targets (SGCN)	
	playas, vernal pools, shallow marshes and meadows, and deep water marshes.	threatened by climate change.		
Springs & Groundwater-Dependent Wetlands	Includes a subset of groundwater-dependent ecosystems which contain sphagnum moss. Also includes headwater springs.	*Good*	Tier 2 Tier 3	Western Toad Northern Bog Lemming
Lake-Nesting Birds	Common Loon is listed as an Intermountain West Waterbird Conservation Plan priority species due to habitat concerns and impacts from recreational boating.	*Poor.* Only one nest has been detected in region and was abandoned before hatch.	Tier 2	Common Loon
Ground-Dwelling Invertebrates	Assemblages of terrestrial invertebrates found on forest and other habitat floors.	*Good.* Habitat and threat data deficient. Many species taxonomically and distributionally data deficient.	Tier 1 Tier 3	Magnum Mantleslug Coeur d'Alene Oregonian Shiny Tightcoil Pale Jumping Slug Western Flat-whorl Spur-throated Grasshopper group
Pond-Breeding Amphibians	Amphibians which primarily breed in lentic wetlands.	*Poor.* Northern Leopard Frogs extirpated from section and face invasive species and disease threats.	Tier 2	Northern Leopard Frog Western Toad
Low-Density Forest Carnivores	Wide ranging mammalian mesocarnivores.	*Poor-Good.* No resident wolverine known to occur. Fisher population appears stable.	Tier 1 Tier 2	Wolverine Fisher
Pollinators	Species delivering pollination ecosystem service.	*Fair.* Many pollinators declining range wide.	Tier 1 Tier 3	Western Bumble Bee Suckley Cuckoo Bumble Bee Monarch Gillette's Checkerspot

Table 2.2 Species of Greatest Conservation Need (SGCN) and associated conservation targets in the Flathead Valley

	Conservation Targets										
Taxon	Dry-Lower Montane Conifer Forest	Mesic Lower Montane Conifer Forest	Subalpine High Montane Conifer Forest	Riverine–Riparian Forest & Shrubland	Depressional Wetlands	Springs & Groundwater-Dependent Wetlands	Lake-nesting birds	Ground-dwelling Invertebrates	Pond Breeding Amphibians	Low Density Forest Carnivores	Pollinators
FISH											
White Sturgeon (Kootenai River DPS)				X							
Burbot				X							
AMPHIBIANS											
Western Toad					X	X			X		
Northern Leopard Frog					X				X		
BIRDS											
Harlequin Duck				X							
Common Loon							X				
Common Nighthawk	X										
Black Swift				X							
Olive-sided Flycatcher	X	X									
Clark's Nutcracker			X								
MAMMALS											
Townsend's Big-eared Bat	X										
Silver-haired Bat	X	X									
Little Brown Myotis	X	X									
Wolverine			X							X	
Fisher	X	X								X	
Grizzly Bear			X								
Mountain Goat			X								
BIVALVES											
Western Ridged Mussel				X							
TERRESTRIAL GASTROPODS											
Pale Jumping slug								X			
Magnum Mantleslug								X			
Coeur d'Alene Oregonian								X			
Kingston Oregonian								X			
Western Flat-whorl								X			
Shiny Tightcoil								X			
INSECTS											

Taxon	Conservation Targets										
	Dry-Lower Montane Conifer Forest	Mesic Lower Montane Conifer Forest	Subalpine High Montane Conifer Forest	Riverine–Riparian Forest & Shrubland	Depressional Wetlands	Springs & Groundwater-Dependent Wetlands	Lake-nesting birds	Ground-dwelling Invertebrates	Pond Breeding Amphibians	Low Density Forest Carnivores	Pollinators
A mayfly (*Ephemerella alleni*)				X							
Morrison Bumble Bee											X
Western Bumble Bee											X
Suckley Cuckoo Bumble Bee											X
Monarch											X
Gillette's Checkerspot											X
Spur-throated Grasshopper group								X			

Target: Dry Lower Montane–Foothill Forest

In the Flathead Valley, nearly 20% of the land cover is classified as Dry Lower Montane–Foothill Forest. While this habitat group can be located at all aspects and slopes; it is predominantly found on the warm-dry, south-southwest, moderately steep slopes within the Cabinet and Purcell Mountains (Cooper et al. 1991). However, it also extends into the valleys that surround the mountain ranges. Elevation ranges from 538 to 1920 m in the Flathead Valley but there are some occurrences above 1920 m. In the dry lower montane-foothill forest, Douglas-fir is a codominate climax species with ponderosa pine (*Pinus ponderosa* Lawson & C. Lawson) in mixed or single species stands (Rocchio 2011). Species such lodgepole pine (*Pinus contorta* Douglas ex Loudon), western larch (*Larix occidentalis* Nutt.) and grand fir (*Abies grandis* [Douglas ex D. Don] Lindl.) only occasionally occur and are found in the wetter microsites within the habitat group (Cooper et al. 1991). Ponderosa pine woodlands are dominant on the driest sites and where fires are frequent and of low severity (Cooper et al. 1991). Historically fires were thought to be frequent and moderate-low severity which maintained open stands of fire-resistant species. Low fire frequency has resulted in a dominance of shrubs and tree species such as grand fir, lodgepole pine, Douglas-fir and western larch in the understory. Currently the habitat group contains a variable understory physiognomy ranging from shrub-dominated and dense with mallow ninebark [*Physocarpus malvaceus* (Greene) Kuntze] and ocean spray [*Holodiscus discolor* (Pursh) Maxim.], to bunch-grass dominated and open with Idaho fescue [*Festuca idahoensis* Elmer] and bluebunch wheatgrass [*Pseudoroegneria spicata* (Pursh) Á. Löve] to name a few species.

Target Viability

Fair. There has been substantial encroachment in the habitat type by more shade-tolerant overstory species due to the lack of normal fire intervals.

Prioritized Threats and Strategies for Dry–Lower Montane Foothill Forest

Very High Threats for Dry–Lower Montane Foothill Forest in the Flathead Valley

Altered fire regimes (fire suppression and stand replacing wildfires)

Historically, moderate-low severity fires that burned on average every 10-30 years maintained the open understory and predominance of shade intolerant species, such as ponderosa pine in the overstory (Smith and Fischer 1997). However, decades of fire suppression activities aided by a cool period in the Pacific decadal oscillation were effective in preventing most moderate fires in the ecosystem while also preventing stand-replacing fires that often enable shade-intolerant species to establish (USDA Forest Service 2013[EIS_IPNF]). This resulted in the encroachment of shade-tolerant species into the habitat group as well as a decrease in fire-tolerant species, increased vertical stand structure, increased canopy closure, increased vertical fuel ladders, greater biomass, greater fire intensities and severities, and increased insect and disease epidemics (Keane et al. 2002). Fire management over the past 15 years has attempted to simulate and re-establish the vegetative composition of regular fire patterns but is hampered by the inability to allow natural fires to burn. Additionally, human population increases have increased the Wildland-Urban Interface (WUI) that often prevents the use of fire as a management tool.

Objective	Strategy	Recommended Action(s)	Target SGCNs
Restore a natural fire interval that promotes historical forest conditions (USDA Forest Service 2013 [monitoring and evaluation program])	Use prescribed and natural fires to maintain desired conditions (USDA Forest Service 2015) Encourage the use of prescribed fire on state, corporate and private lands	Lands within the WUI treated to reduce fuels through mechanical removal or controlled burns (USDA Forest Service 2015) Fire-killed trees are left standing, if they pose no safety hazard, as wildlife habitat (USDA Forest Service 2015)	Olive-sided Flycatcher, Common Nighthawk, Townsend's Big-eared Bat, Little Brown Myotis
Simulate natural fire regimes	Design and implement silvicultural prescriptions that simulate natural disturbance regimes	Actively remove shade-tolerant species	Olive-sided Flycatcher, Common Nighthawk, Townsend's Big-eared Bat, Little Brown Myotis

High Threats for Dry–Lower Montane Foothill Forest in the Flathead Valley

Invasive and noxious weeds

In the drier habitat types, such as the Dry Lower Montane Foothill Forests, invasive/noxious weeds have migrated from disturbed areas such as roads, railroads and utility right-of-ways to undisturbed habitats. Across the Idaho Panhandle National Forest (IPNF), nearly 82% of the warm/dry habitat type is at high risk for invasion by nonnative weeds (USDA Forest Service 2013). Additionally surveys done in the Flathead Valley, found 2 of sites in the Dry Lower Montane Foothill Forest type (n=39) had spotted knapweed or tansy present (Lucid et al. 2015). Species such as spotted knapweed, diffuse knapweed, yellow star thistle, leafy spurge, dyer's woad are particularly invasive within the IPNF and have dispersed into undisturbed areas and displaced native species over large areas (USDA Forest Service 2013).

Objective	Strategy	Recommended Action(s)	Target SGCNs
Identify and eradicate any potential invasive species prior to establishment (USDA Forest Service 2013).	Increased monitoring for invasive and noxious weeds. Coordinate invasive and noxious weed treatment across agencies.	Train agency staff to document presence/absence of noxious weeds during field/site visits. Develop a noxious weed database for all lands across Idaho. Utilize existing technology such as Global Positioning Systems (GPS), remote sensing and Geographic Information Systems (GIS) to efficiently collect, store, retrieve, and analyze and display noxious weed information (ISDA 1999). Implement actions described in the 2012–2016 Idaho Invasive Species Strategic Plan (ISDA 2012)	Olive-sided Flycatcher, Common Nighthawk, Townsend's Big-eared Bat, Little Brown Myotis
Contain and reduce widespread weeds in areas that are already infested (USDA Forest Service 2013).	Coordinate invasive and noxious weed treatment across agencies. Prevent spread of widespread weeds through the identification and treatment of dispersal vectors. Restoration of treated areas with native species.	Weed treatment of high impact areas and roads. (USDA Forest Service 2013) Treat equipment used during timber harvest or fire suppression activities to be "weed-free" (USDA Forest Service 2013, IDL 2015) Revegetate and monitor restoration areas with native species (KTOI 2009) Implement actions described in the 2012–2016 Idaho Invasive Species Strategic Plan (ISDA 2012)	Olive-sided Flycatcher, Common Nighthawk, Townsend's Big-eared Bat, Little Brown Myotis

Unknown status or causes of decline

Multiple species identified as SGCN are declning as as result of unknown causes. The priority for many of these species in the coming years is to identify what are the root causes of their apparent decline, and develop a strategy for addressing it.

Objective	Strategy	Recommended Action(s)	Target SGCNs
Determine causes of decline in Olive-sided Flycatchers	Determine relative importance of known and suspected threats to olive-sided flycatchers, its prey, and their habitats (see Canada's recovery plan, Appendix B; Environment Canada 2015b) Investigate factors affecting reproductive output, survival, and fidelity to breeding sites	Promote cooperation and collaboration with Western Working Group Partners in Flight to fill knowledge gaps and to mitigate threats	Olive-sided Flycatcher
Determine cause(s) of decline for nightjar species in Idaho.	Work with Western Working Group Partners in Flight (WWG PIF) and the Pacific Flyway Nongame Technical Committee (NTC) to assess causes(s) of decline.	Assist WWG PIF with adjusting current Nightjar Survey Network protocols to collect data that will inform potential cause(s) of decline, including assessments of insect prey populations and their habitats. Work with WWG PIF and NTC to identify opportunities for research on contaminant impacts.	Common Nighthawk

Target: Mesic Lower Montane Conifer Forest

In the Flathead Valley, 42% of the land cover is classified as Mesic Lower Montane Forest. Within the Cabinet and Purcell Mountains, this habitat group is located on the slopes, valley bottoms, ravines, canyons and benches with high soil moisture and cool summer temperatures. Elevation ranges from 538-1900 meters, with the lodgepole pine (*Pinus contorta* Douglas ex Loudon) woodlands found generally above 1900 meters and reaching elevations of 2000 meters. Commonly referred to as a cedar/hemlock forest, western hemlock (*Tsuga heterophylla* [Raf.] Sarg.) and western redcedar (*Thuja plicata* Donn ex D. Don) are common in the overstory with grand fir (*Abies grandis* [Douglas ex D. Don] Lindl.), Douglas-fir (*Pseudotsuga menziesii* [Mirb.] Franco), Engelmann spruce (*Picea engelmannii* Parry ex Engelm.), western white pine (*Pinus monticola* Douglas ex D. Don) and western larch (*Larix occidentalis* Nutt.) as frequent associates within the canopy (Cooper et al. 1991). Lodgepole pine also forms woodlands within this habitat group at the upper montane to subalpine areas that are drier and cooler (Crawford 2011). The understory is composed of short and tall shrubs, perennial graminoids, forbs, ferns and mosses, often at levels of in-stand diversity approaching or equal to the diversity found in some eastern deciduous forests (Reid 2013). In depressional areas with a high water table, Devil's club (*Oplopanax horridus* (Sm.) Miq.) is regularly encountered. Forests within this habitat group are often centuries old with fire only passing through every 500 years. The fire interval is long with stand replacing fires occurring 150-500 years and moderate fires 50-100 years (Crawford 2011). Fire suppression has created mixed aged stands that form fuel ladders which make the forest more susceptible to high intensity and stand replacing fires. Disturbance in the form of insect, disease, windfall and ice generally produce canopy openings for the regeneration of forest types. Western white pine was once a predominant canopy species within this habitat group; however logging, fire and the introduction of the white pine blister rust (*Cronartium ribicola*) has decimated this species to below 90% of its historical prevalence (Cooper et al. 1991).

Target Viability

Fair. Substantial encroachment by other habitat types due to lack of natural fires cycle and loss of western white pine.

Prioritized Threats and Strategies for Mesic Lower Montane Conifer Forest

Very High Threats for Mesic Lower Montane Conifer Forest in the Flathead Valley

Altered fire regimes (fire suppression and stand replacing wildfires)

Historically, fires were as variable as the tree species in the forest stand, with an average mean interval of 200-250 years but some stands burning with a mean of 18 years (Smith and Fischer 1997). Stands with fire intervals shorter than 140 years were often dominated by western white pine, western larch, Douglas-fir and grand-fir (Smith and Fischer 1997). However, decades of fire suppression activities aided by a cool period in the Pacific decadal oscillation were effective in preventing most moderate fires in the ecosystem while also preventing stand-replacing fires that often enable shade and fire-intolerant species to establish and heavy fuel loads to build (USDA Forest Service 2013[EIS_IPNF]). This resulted in the encroachment of shade-tolerant species into the habitat group as well as a decrease in fire-tolerant species, increased vertical stand structure, increased canopy closure, increased vertical fuel ladders, greater biomass, greater fire intensities and severities, and increased insect and disease epidemics (Keane et al. 2002). Fire management over the past 15 years has attempted to simulate and re-establish the vegetative composition of regular fire patterns but is hampered by the inability to allow natural fires to burn. Additionally, human population increases have increased the Wildland-Urban Interface (WUI) that often prevents the use of fire as a management tool.

Objective	Strategy	Recommended Action(s)	Target SGCNs
Restore a natural fire interval that promotes historical forest conditions (USDA Forest Service 2013 [monitoring and evaluation program])	Use prescribed and natural fires to maintain desired conditions (USDA Forest Service 2015) Encourage the use of prescribed fire on state, corporate and private lands	Lands within the WUI treated to reduce fuels through mechanical removal or controlled burns (USDA Forest Service 2015) Fire-killed trees are left standing, if they pose no safety hazard, as wildlife habitat (USDA Forest Service 2015)	Olive-sided Flycatcher, Common Nighthawk, Townsend's Big-eared Bat, Silver-haired Bat, Little Brown Myotis
Simulate natural fire regimes	Design and implement silvicultural prescriptions that simulate natural disturbance regimes	Actively remove shade-tolerant species	Olive-sided Flycatcher, Common Nighthawk, Townsend's Big-

Objective	Strategy	Recommended Action(s)	Target SGCNs
			eared Bat, Little Brown Myotis

High Threats for Mesic Lower Montane Conifer Forest in the Flathead Valley

Forest insects and disease epidemics

When at endemic population levels, native forest insects and disease play a critical role in maintaining the health of the forest ecosystem by removing individuals or small groups weakened by drought, injury or fire (USDA Forest Service 2010). However, when large stands of trees are stressed by prolonged drought and/or dense stocking, outbreaks of forest insects and disease can impact tree growth, forest composition and cause extensive tree mortality (USDA Forest Service 2010). Severe outbreaks of forest insects and pathogens can even cause the conversion of forest to shrublands or grasslands. The impact on forest composition from large scale outbreaks is predicted to increase as climate change decreases precipitation and increases temperatures (USDA Forest Service 2010). Currently, 15–20% of lodgepole pine stands in the IPNF are at high risk for attack by the mountain pine beetle (*Dendroctonus ponderosae*), whereas 25–30% of Douglas-fir stands are at high risk for attack by the Douglas-fir pine beetle (*Dendroctonus pseudotsugae*), with each beetle predicted to kill 80% and 60%, respectively of the basal area in high risk stands (USDA Forest Service 2010). The introduction of the exotic white pine blister rust (*Cronartium ribicola*) has reduced western white pine to 5% of its original distribution across the interior Pacific Northwest. This caused changes in forest composition from a relatively stable, fire- and disease- tolerant western white pine forests to early seral forests dominated by the fire and disease –intolerant species such as Douglas-fir, grand fir and subalpine fir (USDA Forest Service 2013).

Objective	Strategy	Recommended Action(s)	Target SGCNs
Reduce risk of stand-replacing pine beetle or root fungus infestations	Use integrative pest management strategies Increase diversity of stand ages, size classes and tree species (KPNZ Climate 2010) Promote responsible firewood harvest/transport	Use pheromones to protect stands (beetle whispering) (Kegley and Gibson 2004) Thin stands to <= 60 basal area Remove debris that attracts pine beetles Cut out infected trees (mistletoe)(IDL 2015)	Olive-sided Flycatcher, Common Nighthawk, Townsend's Big-eared Bat, Silver-haired Bat, Little Brown Myotis
Increase number of rust-resistant western white pine in the ecosystem (USDA Forest Service 2013)	Continue developing genetics of disease resistant trees Planting rust –resistant western white pine during restoration efforts.	Conserve and protect any old-growth western white pine on the landscape. Determine if rust-resistant. (Neuenschwander et al. 1999) Planting rust-resistant trees in openings that are also *Ribes*-free (Neuenschwander et al. 1999)	Olive-sided Flycatcher, Common Nighthawk, Townsend's Big-eared Bat, Little Brown Myotis

Objective	Strategy	Recommended Action(s)	Target SGCNs
		Monitor and remove any signs of the rust on planted trees (USDA Forest Service 2013).	

Unknown status or causes of decline

Multiple species identified as SGCN are declning as as result of unknown causes. The priority for many of these species in the coming years is to identify what is/are the root cause(s) of their apparent decline, and develop a strategy for addressing it.

Objective	Strategy	Recommended Action(s)	Target SGCNs
Determine causes of decline in Olive-sided Flycatchers	Determine relative importance of known and suspected threats to olive-sided flycatchers, its prey, and their habitats (see Canada's recovery plan, Appendix B; Environment Canada 2015b) Investigate factors affecting reproductive output, survival, and fidelity to breeding sites	Promote cooperation and collaboration with Western Working Group Partners in Flight to fill knowledge gaps and to mitigate threats	Olive-sided Flycatcher
Determine cause(s) of decline for nightjar species in Idaho.	Work with Western Working Group Partners in Flight (WWG PIF) and the Pacific Flyway Nongame Technical Committee (NTC) to assess causes(s) of decline.	Assist WWG PIF with adjusting current Nightjar Survey Network protocols to collect data that will inform potential cause(s) of decline, including assessments of insect prey populations and their habitats. Work with WWG PIF and NTC to identify opportunities for research on contaminant impacts.	Common Nighthawk

Target: Subalpine–High Montane Conifer Forest

At the higher elevations within the Cabinet and Purcell Mountains, the Subalpine-High Montane Conifer Forest is the prevalent habitat group. The Subalpine-High Montane Conifer Forest is predominantly found at elevations between 900 to 2133 m in the Cabinet and Purcell Mountains. At the lower elevations within the habitat group where it is still warm enough to sustain, Douglas-fir (*Pseudotsuga menziesii* [Mirb.] Franco), western larch (*Larix occidentalis* Nutt.), and western white pine (*Pinus monticola* Douglas ex D. Don) are found with Engelmann spruce (*Picea engelmannii* Parry ex Engelm.), lodgepole pine (*Pinus contorta* Douglas ex

Loudon) and subalpine fir (*Abies lasiocarpa* [Hook.] Nutt.) in the overstory. Thinleaf huckleberry (*Vaccinium membranaceum* Douglas ex Torr.) and grouse whortleberry (*Vaccinium scoparium* Leiberg ex Coville) are common species in the understory and provide important wildlife forage (Smith and Fischer 1997). Whitebark pine (*Pinus albicaulis* Engelm.) replaces lodgepole pine in higher elevations and becomes dominant as the elevation and climate severity increases. At timberline, the transition zone between continuous forest and the limited alpine, only Engelmann spruce, subalpine fir, subalpine larch and whitebark pine persist. The timberline zone is impacted by drying winds, heavy snow accumulation and subsurface rockiness that lead to stunted growth and a clustered distribution (Cooper et al. 1991, Smith and Fischer 1997). At timberline, whitebark pine is commonly the species that colonizes sites and provides habitat for less hardy species. Whitebark pine also provides food resources for numerous wildlife species, such as Grizzly Bear (*Ursus arctos*), Clark's Nutcracker (*Nucifraga columbiana*) and other small mammals and birds, in the form of large high caloric-value seeds (Fryer 2002). It is a long-lived and slow-growing species that is often overtopped by faster-growing, shade-tolerant species, such as subalpine fir and Engelmann spruce. Fire and other disturbances such as ice, windthrow, rockslides and landside help to maintain whitebark pine as the climax species within the upper elevations of the subalpine. However fire suppression, invasion of the white pine blister rust and mountain pine beetle have all contributed to the recent precipitous declines of whitebark pine across its range (Smith and Fischer 1997, Fryer 2002).

Scotchman's Peak Mountain Goats © 2012 Britta Petersen

Target Viability

Poor to Fair. Subject to altered fire regimes, forest insects, disease, and climate change; reduction in whitebark pine woodlands.

Prioritized Threats and Strategies for Subalpine High Montane Conifer Forest

Very High Threats for Subalpine High Montane Conifer Forest in the Flathead Valley

Altered fire regimes (fire suppression and stand replacing wildfires)

Historically, mixed severity fires burned between 60-300 years with nonlethal burns in the understory of whitebark pine stands at an average interval of 56 years (Smith and Fischer 1997). However tree regeneration in the upper elevation is dependent on soil moisture, temperature and whitebark pine seed cache and may be very slow in some areas. For example, the lack of whitebark pine regeneration after the Sundance Fire (a 56,000 acre wildfire that started on Sundance Mountain in Bonner County in 1967) is thought to be due to a lack of seed cache after mature trees were killed by mountain pine beetle or infected with blister rust (Smith and Fischer 1997). As with the other habitat types, decades of fire suppression activities aided by a cool period in the Pacific decadal oscillation were effective in preventing most moderate fires in the ecosystem while also preventing stand-replacing fires that often enable shade-intolerant species to establish (USDA Forest Service 2013[EIS_IPNF]). This resulted in the encroachment of shade-tolerant species into the habitat group as well as a decrease in fire-tolerant species, increased vertical stand structure, increased canopy closure, increased vertical fuel ladders, greater biomass, greater fire intensities and severities, and increased insect and disease epidemics (Keane et al. 2002). Fire management over the past 15 years has attempted to simulate and re-establish the vegetative composition of regular fire patterns but is hampered by the inability to allow natural fires to burn.

Objective	Strategy	Recommended Action(s)	Target SGCNs
Restore a natural fire interval that promotes historical forest conditions (USDA Forest Service 2013 [monitoring and evaluation program])	Use prescribed and natural fires to maintain desired conditions (USDA Forest Service 2015) Encourage the use of prescribed fire on state, corporate and private lands	Fire-killed trees are left standing, if they pose no safety hazard, as wildlife habitat (USDA Forest Service 2015)	Wolverine, Clark's Nutcracker, Mountain Goat, Hoary Marmot
Simulate natural fire regimes	Design and implement silvicultural prescriptions that simulate natural disturbance regimes	Actively remove shade-tolerant species	Wolverine, Clark's Nutcracker, Mountain Goat, Hoary Marmot

High Threats for Subalpine High Montane Conifer Forest in the Flathead Valley

Climate planning and monitoring

Delineating temperature refugium for cool water or air temperature dependent species is a relatively new idea (Isaak et al. 2015). Recent micro-climate monitoring work in the Idaho Panhandle identified within the Flathead Valley pockets of annually cool air (Lucid et al. 2015). Continued monitoring of micro-climate along with co-occurrence of cool air dependent organisms will provide bedrock information for research determining best management practices for cool air associated species.

Objective	Strategy	Recommended Action(s)	Target SGCNs
Climate monitoring	Monitor climate variables and species co-occurrence over time	Develop climate monitoring program using a variety of micro-climate variables along with co-occurrence of associated SGCN.	Wolverine, Clark's Nutcracker, Mountain Goat, Hoary Marmot
Implement other state management plans	Implement Idaho Wolverine Conservation Strategy	Implement specific actions outlined in climate section of Idaho Wolverine Conservation Strategy	Wolverine, Clark's Nutcracker, Mountain Goat, Hoary Marmot

Forest insects and disease

When at endemic population levels, native forest insects and disease play a critical role in maintaining the health of the forest ecosystem by removing individuals or small groups weakened by drought, injury or fire (USDA Forest Service 2010). However, when large stands of trees are stressed by prolonged drought and/or dense stocking, outbreaks of forest insects and disease can impact tree growth, forest composition and cause extensive tree mortality (USDA Forest Service 2010). Severe outbreaks of forest insects and pathogens can even cause the conversion of forest to shrublands or grasslands. The impact on forest composition from large scale outbreaks is predicted to increase as climate change decreases precipitation and increases temperatures (USDA Forest Service 2010). The introduction of the exotic white pine blister rust has reduced whitebark pine by nearly a quarter to a half in subalpine ecosystems in Northern Idaho and Montana (USDA Forest Service 2010) by reducing the ability of the species to produce cones. In the Selkirk Mountains, an average of 70% of live whitebark pine is already infected by blister rust (Kegley and Gibson 2004). Additionally, mountain pine beetle often kills whitebark pine that are rust resistant (Schwandt 2006). As a keystone species within subalpine ecosystems, the loss of whitebark pine is predicted to negatively impact forest composition, wildlife communities, soil structure and alpine hydrology (Schwandt 2006).

Objective	Strategy	Recommended Action(s)	Target SGCNs
Reduce risk of stand-replacing pine beetle infestations	Use integrative pest management strategies Increase diversity of stand ages, size classes and tree species (KPNZ Climate 2010) Promote responsible firewood harvest/transport	Use pheromones to protect stands (beetle whispering)(Kegley and Gibson 2004) Thin stands to <= 60 basal area Remove debris that attracts pine beetles Cut out infected trees (mistletoe) (IDL 2015)	Clark's Nutcracker, Grizzly Bear
Increase number of rust-resistant whitebark pine in the ecosystem (USDA Forest Service	Continue developing genetics of disease resistant trees	Monitor rust and beetle levels in live whitebark pine. Collect rust-resistant seed for testing and restoration (Schwandt	Clark's Nutcracker, Grizzly Bear

Objective	Strategy	Recommended Action(s)	Target SGCNs
2013)	Planting rust –resistant whitebark pine during restoration efforts.	2006) Planting rust-resistant trees in openings that are also *Ribes*-free (Neuenschwander et al. 1999) Monitor and remove any signs of the rust on planted trees (USDA Forest Service 2013).	

Target: Riverine–Riparian Forest and Shrubland

In the Flathead Valley, the riverine ecosystem includes all rivers, streams, and smaller order waterways (1–3 order; Strahler stream order) and their associated floodplain and riparian vegetation. Major rivers (those designated as 4+ order in Strahler stream order) in the Flathead Valley includes the Moyie, Kootenai and Clark Fork Rivers. The Kootenai River is the only drainage in Idaho with a native Burbot (ling) population and is home to a genetically distinct population of White Sturgeon. Fisheries for both of these species were closed for conservation purposes in 1984 in response to major declines in these populations. Alteration of the natural flow regime, substrate, temperature, and nutrients are believed to be the primary reasons for the lack of successful reproduction of sturgeon and burbot (IDFG 2008). Other rivers and streams in the region support numerous fisheries and provide host habitat for several mussel species. High velocity mountain streams provide important nesting habitat for Harlequin Ducks. In the Flathead Valley there are numerous waterfalls documented for the region. Waterfalls support aquatic organisms uniquely adapted to extremely high water velocities and plants and animals that require cool, constantly moist rocky habitats. Waterfalls also provide important nesting habitat for Black Swift. There are at least 3 Black Swift nesting colonies detected in the Flathead Valley (Miller 2013).

Moyie River, 2013 IDFG

Target Viability

Fair. Kootenai River is subjected to sometimes very high to more often very low levels of nutrients that influence aquatic invertebrate load and thus fish. Changed seasonal flooding impacts important habitat for fish and aquatic invertebrates. Other rivers are influenced by changed hydrographic regime.

Prioritized Threats and Strategies for Riverine–Riparian Forest and Shrubland

Very High Threats for Riverine–Riparian Forest and Shrubland in the Flathead Valley

Aquatic invasive invertebrate and plant species

Aquatic invasive species are often the hardest to detect and eradicate. Across the nation, Zebra (*Dreissena polymorpha*)and Quagga Mussel (*Dreissena bugensis*) have disrupted food chains, competed with native species and cost millions of dollars of damage to municipalities by choking water intake pipes and other facilities (Pimental et al. 2004). Although zebra and quagga mussels have not yet been detected in the water bodies of the Flathead Valley, several boat check stations in the region have found the mussels on boats traveling through the area (State of Idaho Agriculture, accessed on Nov 2, 2015). It is a goal of the state that neither mussel is ever established in any of the Idaho water ways. Other aquatic invasive species such as Eurasian watermilfoil (*Myriophyllum spicatum* L.), flowering rush (*Butomus umbellatus* L.) and curly pondweed (*Potamogeton crispus* L.) have been detected and established in the Kootenai and Clark Fork Rivers (T. Woolf, pers. comm.). These species easily spread through the movement of boats between the recreational lakes, rivers and streams in the region. For most of the aquatic plant species, only a fragment of the vegetated matter is necessary to establish the species in a new area. Aquatic invasive plant species, particularly water milfoil, often form dense mats that prevent the establishment of native aquatic plant species and degrade wildlife and fish habitat (ID Invasive Species Counsel and ID State Dept. of Agriculture 2007).

Objective	Strategy	Recommended Action(s)	Target SGCNs
Prevent the establishment of aquatic invasive species in noninvaded riverine systems	Increase monitoring of riverine systems. Increase monitoring and treatment of dispersal vectors for invasive species.	Determine which riverine systems are not impacted by aquatic invasive species. Establish a monitoring schedule to visit un-invaded but high-risk riverine systems. Educate the public about the dangers of associated with spreading an aquatic invasive species (ID Invasive Species Counsel and ISDA 2007). Maintain boat-check stations for the regular inspection for aquatic invasive species.	White Sturgeon, Burbot, Western Ridged Mussel, *Ephemerella alleni*
Contain and eradicate populations of Eurasian watermilfoil, flowering rush, and curlyleaf pondweed.	Implement actions indicated in the ISDA's 2008 Statewide Strategic Plan For Eurasian Watermilfoil	Survey invaded waters to determine extent of nonnative aquatic species distribution. Develop treatment priorities based on water body use. Develop strategies for eradication based on water body hydrology and use.	White Sturgeon, Burbot, Western Ridged Mussel, *Ephemerella alleni*

Objective	Strategy	Recommended Action(s)	Target SGCNs
	In Idaho	Regularly monitor and re-treat areas after initial treatment. (ID Invasive Species Counsel and ISDA 2007)	

Invasive and noxious weeds

Invasive species often prevent the establishment of native species by forming dense monocultures and in some instances even change the soil chemistry or hydrology of the invaded area (Ricciardi et al. 2013). In plant surveys conducted at several of the creeks within the Pend Oreille WMA, found an overall increase in noxious weed coverage at several of the properties, with a range of 0.46–28.25% coverage (Cousins and Antonelli 2008). Rapid Lightning Creek was identified as having the highest cover of noxious weeds of all of the riparian areas (Cousins and Antonelli 2008). Reed canarygrass was also predominant at many of the survey sites with 16.32% coverage of interior riparian areas (Cousins and Antonelli 2008). Reed canarygrass is a native species in the lower 48 but is considered a noxious weed in Washington and is thought to have hybridized with a nonnative invasive reed canarygrass (Lavergne and Molofsky 2007). Reed canarygrass forms dense monocultures that decreases plant diversity and degrades wildlife habitat.

Objective	Strategy	Recommended Action(s)	Target SGCNs
Identify and eradicate any potential invasive species prior to establishment (USDA Forest Service 2013).	Increased monitoring for invasive and noxious weeds. Coordinate invasive and noxious weed treatment across agencies.	Train agency staff to document presence/absence of noxious weeds during field/site visits. Develop a noxious weed database for all lands across Idaho. Utilize existing technology such as Global Positioning Systems (GPS), remote sensing and Geographic Information Systems (GIS) to efficiently collect, store, retrieve, and analyze and display noxious weed information (ISDA 1999). Implement actions described in the 2012–2016 Idaho Invasive Species Strategic Plan (ISDA 2012)	White Sturgeon, Burbot
Contain and reduce widespread weeds in areas that are already infested (USDA Forest Service 2013).	Coordinate invasive and noxious weed treatment across agencies. Prevent spread of widespread weeds through the identification and treatment of dispersal vectors. Restoration of treated areas	Weed treatment of high impact areas/roads. (USDA Forest Service 2013) Treat equipment used during timber harvest or fire suppression activities to be “weed-free” (USDA Forest Service 2013, IDL 2015) Revegetate and monitor	White Sturgeon, Burbot

Objective	Strategy	Recommended Action(s)	Target SGCNs
	with native species.	restoration areas with native species (KTOI 2009) Implement actions described in the 2012–2016 Idaho Invasive Species Strategic Plan (ISDA 2012)	

High Threats for Riverine–Riparian Forest and Shrubland in the Flathead Valley

Population declines of Harlequin Duck

In Idaho, Harlequin Ducks are uncommon and occupy high quality streams from the Canadian border south to the Selway River and in the Greater Yellowstone Ecosystem. Breeding streams are relatively undisturbed with high elevation gradients, cold, clear, and swift water, rocky substrates, and forested bank vegetation. Harlequin Ducks use different stream reaches over the course of the breeding season depending on environmental conditions (e.g., timing and magnitude of stream runoff, food abundance) and reproductive chronology (i.e., pre-nesting, nesting, early and late brood-rearing), but remain closely tied to rivers and streams for food, security, and escape cover from predators. There are an estimated 50 pairs of harlequin ducks that breed in Idaho (IDFG unpublished data). From 1996 to 2007 there was no statistically significant change in the statewide population. However, there were possible declines on several rivers including the Moyie River, Granite Creek (Lake Pend Oreille drainage) and the St. Joe River. However, distribution and abundance of Harlequin Duck has not been assessed since 2007.

Objective	Strategy	Recommended Action(s)	Target SGCNs
Develop priority land management and recreation actions to benefit harlequin ducks.	Design research projects that improve understanding of the factors that influence occupancy, survival, and reproduction.	Mark and track individuals on the breeding grounds using telemetry (e.g., platform transmitter terminals (PTTs) or geolocators) to better understand habitat use, survival rates, causes and timing of mortality, patterns and timing of movements, linkages between breeding, molting, and wintering areas, and return rates. Seek partnerships with coastal states and provinces to study wintering ecology and habitat use. Investigate how stream flow characteristics (severity, timing, and frequency of peak and low stream flows) affect harlequin duck productivity and survival. Assess population implications under forecasted climate models. Investigate how human disturbance and changes in forest management affect behavior, occupancy, reproductive success, and survival.	Harlequin Duck
Implement a harlequin duck	Develop partnerships, funding and capacity	Conduct spring pair surveys and summer brood surveys following the protocol	Harlequin Duck

Objective	Strategy	Recommended Action(s)	Target SGCNs
population monitoring program.	to conduct breeding surveys statewide on a regular basis.	established in the Harlequin Duck Conservation Assessment and Strategy for the US Rocky Mountains (Cassirer et al. 1996). Where local declines are apparent, expand surveys upstream of historically occupied stream reaches. Coordinate surveys with MT, WY, WA, OR, BC, AB to facilitate a northwest regional population assessment. Incorporate harlequin duck surveys into riverine multi-taxa monitoring programs.	
Provide and protect high quality breeding habitat (nesting habitat, security cover, food) for harlequin duck on breeding streams.	Maintain and protect water quality, quantity, and natural flow regimes and riparian vegetation.	Introduce buffer zones along montane riparian habitats to maintain riparian structure and function, including snags and woody debris. Avoid siting projects (e.g., water diversions, dams, and hydropower developments, mining, road construction, clear-cut logging) on breeding streams and in the adjacent uplands that might alter runoff and water quality to sustain food supply, suitable foraging conditions, and continuous habitat during the breeding season. Manage grazing (length and timing of season, stock levels, location, development of water sources) to maintain stream bank stability and riparian vegetation (especially shrubs).	Harlequin Duck

Unknown status of Black Swift

Very little is known about breeding Black Swifts in Idaho. Black Swifts are not generally detected during breeding bird surveys. Additionally, their cryptic nesting sites and small colony sizes are obstacles when determining distribution or abundance in the state. In 2013, a survey of breeding locations for Black Swift found evidence of nesting at 5 of the 16 waterfalls visited and roosting swifts at 2 of the waterfalls (Miller 2013).

Objective	Strategy	Recommended Action(s)	Target SGCNs
Determine current breeding locations of Black Swifts	Conduct a comprehensive survey of potential nesting locations	Work with partners, including Intermountain Bird Observatory, to develop and implement a systematic survey.	Black Swift

Declines in beaver populations

Beaver populations currently exist at lower than historic levels across the western US. This results is a host of ecological consequences. Beaver restoration efforts have been shown to be an effective tool to restoring habitat and ecological function to riverine systems.

Objective	Strategy	Recommended Action(s)	Target SGCNs
Determine current status of beaver populations.	Determine past and current status of beaver populations.	Conduct analysis to determine feasibility and potential mechanisms of beaver restoration. Implement actions delineated by above analysis.	Western Ridged Mussel, *Ephemerella alleni*

Target: Depressional Wetlands

Depressional wetlands are any wetlands found in a topographic depression. Depressional wetlands include vernal pools, old oxbows, disconnected river meanders and constructed wetlands. In the Flathead Valley, this includes many of the wetlands found within the Pend Oreille WMA and within the floodplains of the Moyie River, Round Prairie Creek, Kootenai River and Clark Fork River. Other depressional wetlands are found within the Purcell and Cabinet Mountains wherever the elevational lines close and surface waters accumulate. Small depressional ponds (less than 2 meters deep) commonly occur within the Purcell and Cabinet and provide breeding habitat for Western Toads. Depressional wetlands often support emergent marsh or shrub swamps that are composed of broad-leaf cattail (*Typha latifolia* L.), panicled bulrush (*Scirpus microcarpus* J. Presl & C. Presl), creeping bentgrass (*Agrostis stolonifera* L.), rose spirea (*Spiraea douglasii* Hook.) and grey alder (*Alnus incana* [L.] Moench). In the valley bottoms, reed canarygrass (*Phalaris arundinacea* L) often forms impenetrable monocultures that limit species diversity within the wetlands (Cousins, personal comm.). Amphibians, waterbirds, marshbirds, and waterfowl all utilize depressional wetlands for breeding and foraging habitats.

Cabinet Mountains © 2014 Shannon Ehlers

Target Viability

Fair. Lower elevations experiencing altered hydrological regimes and invasive species/disease. Higher elevations threatened by climate change.

Prioritized Threats and Strategies for Depressional Wetlands

Very High Threats for Depressional Wetlands in the Flathead Valley

Invasive and noxious weeds

Invasive species often prevent the establishment of native species by forming dense monocultures and in some instances even change the soil chemistry or hydrology of the invaded area (Ricciardi et al. 2013). In plant surveys within the Pend Oreille WMA noxious weeds such as oxeye daisy, spotted knapweed and common tansy were documented to cover 0.45–28.45% of the overall sites (Cousins and Antonelli 2008). Additionally, all of the wetlands sites were classified as reed canarygrass dominant (Cousins and Antonelli 2008). Reed canarygrass is a native species in the lower 48 but is considered a noxious weed in Washington and is thought to have hybridized with a nonnative invasive reed canarygrass (Lavergne and Molofsky 2007). Reed canarygrass forms dense monocultures that decreases plant diversity and degrades wildlife habitat. Additionally surveys done in the Flathead Valley, found 12 of the ponds, small lakes and emergent wetlands (n=44) surveyed had spotted knapweed or tansy present (Lucid et al. 2015).

Objective	Strategy	Recommended Action(s)	Target SGCNs
Identify and eradicate any potential invasive species prior to establishment (USDA Forest Service 2013).	Increased monitoring for invasive and noxious weeds. Coordinate invasive and noxious weed treatment across agencies.	Train agency staff to document presence/absence of noxious weeds during field/site visits. Develop a noxious weed database for all lands across Idaho. Utilize existing technology such as Global Positioning Systems (GPS), remote sensing and Geographic Information Systems (GIS) to efficiently collect, store, retrieve, and analyze and display noxious weed information (ISDA 1999). Implement actions described in the 2012–2016 Idaho Invasive Species Strategic Plan (ISDA 2012)	Western Toad, Northern Leopard Frog, Silver-haired Bat, Townsend's Big-eared Bat, Little Brown Bat
Contain and reduce widespread weeds in areas that are already infested (USDA Forest Service 2013).	Coordinate invasive and noxious weed treatment across agencies. Prevent spread of widespread weeds through the identification and treatment of dispersal vectors. Restoration of treated areas with native species.	Continue annual noxious weed control program and coordinate weed management activities with Bonner County and the Selkirk Cooperative Weed Management Area. (Cousins and Antonelli 2008) Weed treatment of high impact areas/roads (USDA Forest Service 2013).	Western Toad, Northern Leopard Frog, Silver-haired Bat, Townsend's Big-eared Bat, Little Brown Bat

Objective	Strategy	Recommended Action(s)	Target SGCNs
		Treat equipment used during timber harvest or fire suppression activities to be "weed-free" (USDA Forest Service 2013, IDL 2015) Revegetate and monitor restoration areas with native species (KTOI 2009). Implement actions described in the 2012–2016 Idaho Invasive Species Strategic Plan (ISDA 2012)	

High Threats for Depressional Wetlands in the Flathead Valley

Climate planning and monitoring

Delineating temperature refugium for cool water or air temperature dependent species is a relatively new idea (Isaak et al. 2015). Recent micro-climate monitoring work in the Idaho Panhandle identified within the Flathead Valley pockets of annually cool air (Lucid et al. 2015). Continued monitoring of micro-climate along with co-occurrence of cool air dependent organisms will provide bedrock information for research determining best management practices for cool air associated species.

Objective	Strategy	Recommended Action(s)	Target SGCNs
Climate monitoring	Monitor climate variables and species co-occurrence over time	Develop climate monitoring program using a variety of micro-climate variables along with co-occurrence of associated SGCN.	Western Toad, Northern Leopard Frog, Silver-haired Bat, Townsend's Big-eared Bat, Little Brown Myotis

Target: Springs and Groundwater Dependent Wetlands

In the Flathead Valley, peatlands are one of the most conspicuous types of groundwater dependent wetlands with over 7 sites identified (Lichthardt 2004) within the ecoregion. Peatlands are found on waterlogged soils with at least 30 cm peat accumulation and range from nutrient poor (poor fens) to nutrient rich (rich fens and palustrine forests) (Bursik and Mosely XXXX—need year). They often host a diversity of boreal plant species that are disjunct from their core range and species that are unique in their ability to persist in nutrient- and oxygen-poor soils (Lichthardt 2004). Surveys for Northern Bog Lemming in Montana (Reichel and Corn 1997) and Idaho (Groves 1994) have found the species frequently in wetland habitats with a peat component. Cold-water springs and other groundwater dependent wetlands are also widespread within the Purcell and Cabinet Mountains, particularly within the glaciated canyons and headwater streams. They often provide a cold-water refugium for invertebrate and vertebrate species (Issak et al. 2015).

Cabinet Mountains-Round-leaf Sundew © 2014 Andrew Gygili

Target Viability

Good.

Prioritized Threats and Strategies for Springs and Groundwater Dependent Wetlands

Very High Threats for Springs and Groundwater Dependent Wetlands in the Flathead Valley

Invasive and noxious weeds

Invasive species often prevent the establishment of native species by forming dense monocultures and, in some instances, even changing the soil chemistry or hydrology of the invaded area (Ricciardi et al. 2013). In plant surveys within the Pend Oreille WMA noxious weeds such as oxeye daisy, spotted knapweed and common tansy were documented to cover 0.45–28.45% of the overall sites (Cousins and Antonelli 2008). Additionally, all of the wetlands sites were classified as reed canarygrass dominant (Cousins and Antonelli 2008). Reed canarygrass is a native species in the lower 48 but is considered a noxious weed in Washington and is thought to have hybridized with a nonnative invasive reed canarygrass (Lavergne and Molofsky 2007). Reed canarygrass forms dense monocultures that decreases plant diversity and degrades wildlife habitat.

Objective	**Strategy**	**Recommended Action(s)**	**Target SGCNs**
Identify and eradicate any potential invasive species prior to establishment (USDA Forest Service 2013).	Increased monitoring for invasive and noxious weeds. Coordinate invasive and noxious weed treatment across agencies.	Train agency staff to document presence/absence of noxious weeds during field/site visits. Develop a noxious weed database for all lands across Idaho. Utilize existing technology such as Global Positioning Systems (GPS), remote sensing and Geographic Information Systems (GIS) to efficiently collect, store, retrieve, and analyze and display noxious weed information (ISDA 1999). Implement actions described in the 2012–2016 Idaho Invasive Species Strategic Plan (ISDA 2012)	Western Toad, Northern Bog Lemming
Contain and reduce widespread weeds in areas that are already infested (USDA Forest Service 2013).	Coordinate invasive and noxious weed treatment across agencies. Prevent spread of widespread weeds through the identification and treatment of dispersal vectors. Restoration of treated areas with native species.	Continue annual noxious weed control program and coordinate weed management activities with Bonner County and the Selkirk Cooperative Weed Management Area. (Cousins and Antonelli 2008) Weed treatment of high impact areas/roads. (USDA Forest Service 2013) Treat equipment used during timber harvest or fire suppression activities to be "weed-free" (USDA Forest Service 2013, IDL 2015) Revegetate and monitor restoration areas with native species (KTOI 2009). Implement actions described in the 2012–2016 Idaho Invasive Species Strategic Plan (ISDA 2012)	Western Toad, Northern Bog Lemming

High Threats for Springs and Groundwater Dependent Wetlands in the Flathead Valley

Climate planning and monitoring
Delineating temperature refugium for cool water or air temperature dependent species is a relatively new idea (Isaak et al. 2015). Recent micro-climate monitoring work in the Idaho Panhandle identified within the Flathead Valley pockets of annually cool air (Lucid et al. 2015). Continued monitoring of micro-climate along with co-occurrence of cool air dependent organisms will provide bedrock information for research determining best management practices for cool air associated species.

Objective	Strategy	Recommended Action(s)	Target SGCNs
Climate monitoring	Monitor climate variables and species co-occurrence over time	Develop climate monitoring program using a variety of micro-climate variables along with co-occurrence of associated SGCN.	Western Toad, Northern Bog Lemming

Target: Lake–nesting Birds

The only lake-nesting bird detected in the Flathead Valley is Common Loon. Common Loons build platform nests on lake edges or in shallow water. Nesting has only been documented in a few locations in Idaho but nonflying juvenile loons were observed on the north end of Priest Lake, Upper Priest Lake and the Clark Fork Delta on Lake Pend Oreille in the 1990s (CWCS 2005) however there have been no recent sightings.

Target Viability

Poor. One nest was abandoned in 2014, no other documentation of nesting loons in the region.

High Threats for Lake-nesting Birds in the Flathead Valley

<In progress>

Target: Ground-dwelling Invertebrates

Ground dwelling invertebrates provide essential ecosystem services including decomposition, nutrient cycling, food for vertebrates, plant pollination, seed dispersal, and disease vectoring. They can also serve as effective indicators of environmental health (Jordan and Black 2012). This group encompasses a very wide array of taxa. However, Flathead Valley SGCN in this group are limited to terrestrial gastropods and spur-throated grasshoppers.

Target Viability

Good. Habitat and threat data deficient. Many species taxonomically and distributionally data deficient.

Cabinet Mountains-Magnum Mantleslug © Shannon Ehlers 2013

Species designation, planning and monitoring

Basic knowledge of ecological requirements, habitat needs, systematics, and distribution is lacking for the majority of ground invertebrates. Spur throated grasshoppers are in need of basic taxonomic work. While substantial knowledge of terrestrial gastropod distribution and microclimate requirements was obtained during work conducted from 2010-2014 (Lucid et al. 2015), much work remains to be done gain an adequate understanding of basic conservation needs for these species. Four terrestrial gastropods are known to be associated with cooler than average mean annual air temperatures (Lucid et al. 2015). Managing micro-sites for these species for cool air temperatures and minimal disturbance is recommended until a better ecological understanding is developed through research and monitoring.

Objective	Strategy	Recommended Action(s)	Target SGCNs
Determine appropriate taxonomic status of species within the spur throated grasshopper group.	Investigate and validate taxonomic status.	Conduct field surveys to collect specimens. Conduct morphological and genetics work to determine species status.	Spur Throated Grasshopper Group.
Determine appropriate taxonomic status of sub-species within the Coeur d'Alene Oregonian species complex.	Investigate and validate taxonomic status.	Conduct field surveys to collect specimens. Conduct morphological and genetics work to determine species status.	Coeur d'Alene Oregonian
Conduct research and habitat conservation activities for cool air temperature associated gastropods (Lucid et al.	Develop a better understanding of requirements for these species.	Conduct research to assess ecological requirements for these species. Manage forest structure near micro-sites to maintain cool air temperatures. Manage these sites for minimal disturbance. Implement long term monitoring of species and associated micro-climate and other habitat	Magnum Mantleslug, Pale Jumping Slug, Shiny Tightcoil

Objective	Strategy	Recommended Action(s)	Target SGCNs
2015).		requirements.	
Determine appropriate taxonomic status of species within the harvestman species group.	Investigate and validate taxonomic status.	Conduct field surveys to collect specimens. Conduct morphological and genetics work to determine species status.	Harvestman Species Group.

Target: Pond-breeding Amphibians

Amphibians are a highly vulnerable taxonomic group which, globally, hosts more species in decline than birds or mammals (Stuart et al. 2004). Amphibian populations have been declining world-wide for decades (Houlahan 2000) and sometimes occur rapidly in seemingly pristine environments (Stuart et al. 2004). Amphibians are susceptible to pathogens, climate change, environmental pollution, ultraviolet-b exposure, and invasive species (Bridges and Semlitsch 2000, Cushman 2006, Kiesecker et al. 2001, Stuart et al. 2004). In addition, they tend to have relatively low vagilities (Bowne and Bowers 2004, Cushman 2006) and often have narrow habitat requirements (Cushman 2006).

Western toads have experienced range-wide declines in western North America. This species could be experiencing similar declines in the Flathead Valley as it is not detected as frequently in this section as the neighboring Okanogan Highlands (Lucid et al. 2015). Northern Leopard frogs are abundant across their range, but have experienced severe declines in portions of their range, including northern Idaho. Northern leopard frogs appear to be extirpated from the Flathead Valley (Lucid et al. 2015).

Target Viability

Poor. Northern Leopard Frogs extirpated from section and extant species face invasive species/disease threats.

Prioritized Threats and Strategies for Pond-breeding Amphibians

High rated threats to Pond-breeding Amphibians in the Flathead Valley

Chytrid fungus and other disease

Recent surveys for chytrid fungus on Columbia spotted frogs across the Flathead Valley indicated the fungus is widespread, occurring at approximately 83% of surveyed sites. Chytrid was found more commonly at low and high elevation sites than mid-elevation sites. Chytrid is a known threat to western toads and has been documented to cause near total egg hatching failure of a western toad population in the Pacific Northwest (Blaustein et al. 1994). Further research is needed to assess the threat of chytrid to Western Toads and Northern Leopard Frogs in Idaho. Local die offs of Western Toads and other amphibians have been recorded in recent years. These die offs may be disease related and those sites should be investigated and monitored.

Objective	Strategy	Recommended Action(s)	Target SGCNs
Determine level	Determine status	Visit known toad sites and swab toads for	Western Toad

Objective	Strategy	Recommended Action(s)	Target SGCNs
of threat to Western Toads.	of chytrid in Western Toads.	chytrid.	
Monitor amphibian disease.	Develop amphibian disease monitoring program.	Develop monitoring program which encompasses monitoring chytrid presence, chytrid levels, and other potential amphibian disease.	Western Toad, Northern Leopard Frog

Extirpation of Northern Leopard Frogs

Extensive surveys indicate this species has been extirpated from the Flathead Valley (Lucid et al. 2015). The closest known colony of this species occurs at the Creston Wildlife Management Area in British Columbia. This population could potentially serve as a source population for human assisted reintroduction or natural re-colonization efforts. Nonnative bullfrogs occur on the U.S. side of the border but have not been detected on the British Columbia side. It is critically important to initiate immediate control and extirpation efforts on the most northern bullfrogs in Idaho to prevent their dispersal to the Creston Wildlife Management Area.

Objective	Strategy	Recommended Action(s)	Target SGCNs
Address Northern Leopard Frog Extirpation	Work with trans-boundary partners in Idaho, Washington and British Columbia	Conduct a literature review assessing potential recovery options including re-introduction and natural re-colonization for this species.	Northern Leopard Frog
Bullfrogs	Prevent bullfrog expansion to Creston Wildlife Management Area northern Leopard frog colony.	Work with partners to conduct bullfrog control and extirpation actions near the Canadian border.	Northern Leopard Frog

Climate planning and monitoring

Delineating temperature refugium for cool water or air temperature dependent species is a relatively new idea (Isaak et al. 2015). Recent micro-climate monitoring work in the Idaho Panhandle identified within the Flathead Valley pockets of annually cool air (Lucid et al. 2015). Continued monitoring of micro-climate along with co-occurrence of cool air dependent organisms will provide bedrock information for research determining best management practices for cool air associated species.

Objective	Strategy	Recommended Action(s)	Target SGCNs
Climate monitoring	Monitor climate variables and species and disease co-occurrence over time	Develop climate monitoring program using a variety of micro-climate variables along with co-occurrence of associated SGCN. Monitor chytrid fungus in relation to micro-climate variables.	Western Toad, Northern Leopard Frog

Target: Low Density Carnivores

Forest carnivores naturally occur at low densities and can be directly affected by human activities. This presents unique opportunities to directly affect positive conservation outcomes for these species. This group consists of mammals traditionally considered 'furbearers', including marten, weasels, and mink. Wolverine and fisher are the two native forest carnivore SGCN which occur within the Flathead Valley. Extensive surveys from 2010–2014 failed to detect a single resident wolverine. However, several verified detections of the species did occur during that time frame (Lucid et al. 2015). There was a verified track and a verified photo. An individual animal was not identified despite extensive genetic surveys. This suggests the detections were of an animal moving across the landscape, not residing in it. The 2010–2014 surveys detected 33 individual fisher in the Cabinet Mountains. This population may be the result of a reintroduction effort which occurred in the late 1980s and early 1990s (Vinkey et al. 2006). Wolverine conservation efforts in this section should focus on maintaining or improving ecosystem integrity conducive to the establishment of resident and reproductive individuals. Fisher conservation efforts should focus on population monitoring.

Cabinet Mountains Fisher, 2012 IDFG

Target Viability

Poor. Only a few individuals known to occur in section.

Prioritized Threats and Strategies for Low Density Carnivores

High rated threats to Low Density Carnivores in the Flathead Valley

Genetic isolation

Wolverine and fisher were nearly or completely extirpated from the lower 48 states in the early 20th century. A variety of natural (wolverine) and human mitigated (fisher) re-colonization events have likely affected the genetic structure of populations of the species (Aubry et al. 2007, Vinkey et al. 2006). Populations of both species likely have low genetic diversity due to founder affects. Proper habitat management and gene flow mitigation may help improve genetic isolation and increase species occurrence on the landscape.

Objective	**Strategy**	**Recommended Action(s)**	**Target SGCNs**
Monitor genetic isolation	Determine current levels of	Conduct genetic analyses to determine currently population sizes and levels of gene	Wolverine, Fisher

Objective	Strategy	Recommended Action(s)	Target SGCNs
	genetic isolation	flow. Maintain trans-boundary collaborations to assess and monitor wolverine gene flow with Canadian populations.	
Assess and enhance gene flow	Manage connectivity habitat and assess potential to enhance gene flow.	Manage forested lowland habitat to maintain forested connectivity. Improve additional lowland forest to increase connectivity. Conduct analysis and literature review assessing potential recovery options including re-introduction and natural re-colonization.	Wolverine, Fisher

Winter recreation

The Idaho Wolverine Conservation plan (IDFG 2014) outlines specific actions to minimize potential disturbance of wolverine by oversnow recreation and ski area infrastructure.

Objective	Strategy	Recommended Action(s)	Target SGCNs
Manage winter recreation minimize disturbance	Coordinate efforts between public and private entities.	Implement strategies outlined in Idaho Wolverine Conservation Plan (IDFG 2014).	Wolverine

Climate planning and monitoring

Delineating temperature refugium for cool water or air temperature dependent species is a relatively new idea (Isaak et al. 2015). Recent micro-climate monitoring work in the Idaho Panhandle identified within the Flathead Valley pockets of annually cool air (Lucid et al. 2015). Continued monitoring of micro-climate along with co-occurrence of cool air dependent organisms will provide bedrock information for research determining best management practices for cool air associated species.

Objective	Strategy	Recommended Action(s)	Target SGCNs
Climate monitoring	Monitor climate variables and species co-occurrence over time	Develop climate monitoring program using a variety of micro-climate variables along with co-occurrence of associated SGCN.	Wolverine, Fisher
Implement other state management plans	Implement the Idaho Wolverine Conservation Plan (IDFG 2014)	Implement specific actions outlined in the climate section of the Idaho Wolverine Conservation Plan (IDFG 2014)	Wolverine

Target: Pollinators

Pollinators provide an essential ecosystem service which benefits agricultural producers, agricultural consumers, and gardeners (Mader et al. 2011) in the Flathead Valley. A wide range of taxa including birds, bats, and a wide array of insects provide pollination activities. Two butterflies (Gillette's Checkerspot and Monarchs) and two bees (Western Bumble Bee and Suckley Cuckoo Bumble Bee) comprise the group of four SGCN pollinators which are known to occur within this ecological section.

Many pollinators, but particularly bees, are known to be experiencing population declines throughout North America (Mader et al. 2011) and those declines may be occurring within the Flathead Valley as well. Population declines and local die offs occur for a variety of reasons including habitat loss, pesticide exposure, and climate change (Mader et al. 2011). The Flathead Valley is ripe with opportunity to address these threats and increase the status of SGCN pollinators. Farmers, habitat mangers, roadway authorities, municipalities, and homeowners can all contribute to pollinator conservation in clear and productive ways.

Target Viability

Fair. Many pollinators declining range wide.

Prioritized Threats and Strategies for Pollinators

High rated threats to Pollinators in the Flathead Valley

Pesticides

Pollinators are negatively affected by pesticides by absorbing pesticides through the exoskeleton, drinking nectar containing pesticides, and carrying pollen laced with pesticides back to colonies (Mader et al. 2011). Neonicotinoids are particularly harmful to bee populations and can cause dramatic die-offs (Hopwood et al. 2012). While the most effective pollinator benefitting strategy is to eliminate pesticide use. Significant benefit for pollinators can still be achieve through reducing use of and pollinator exposure to pesticides (Mader et al. 2011).

Objective	Strategy	Recommended Action(s)	Target SGCNs
Reduce native pollinator exposure to pesticides (Mader et al. 2011).	Educate habitat managers, farmers, municipalities, and small property owners in methods to eliminate pesticide use (Mader et al. 2011).	Conducted educational activities which encourage potential pesticide applicators to eliminate use of pesticides where practical. Where pesticides must be used encourage applicators to apply the minimum amount of chemical necessary and apply when pollinators are least active (i.e. nighttime and when flowers are not blooming) (Mader et al. 2011). Specifically target urban homeowners in educational efforts in the elimination of or proper application of pesticides (Mader et al. 2011). Conduct workshops which discuss pesticides in relation to other pollinator habitat management concerns (Mader et al. 2011).	Western Bumble Bee, Suckley Cuckoo Bumble Bee, Monarch
Reduce native pollinator exposure to pesticides on IDFG administered	Implement measures to reduce or eliminate pesticide use on IDFG WMAs and	Use the minimum recommended amount of pesticide (Mader et al. 2011). Apply pesticides at times when pollinators are least active such as nighttime, cool periods, low wind activity, and when flowers are not	Western Bumble Bee, Suckley Cuckoo Bumble Bee, Monarch

Objective	Strategy	Recommended Action(s)	Target SGCNs
property (Mader et al. 2011).	other properties (Mader et al. 2011).	blooming (Mader et al. 2011). Mow or otherwise remove flowering weeds before applying pesticides (Mader et al. 2011).	
Eliminate use of neonicotinoid insecticides (Hopwood et al. 2012).	Education measures on the detrimental effects of neonicotinoids on bees (Hopwood et al. 2012).	Develop and distribute educational material. Distribute to municipalities, counties, agriculture producers, habitat managers, and other property owners (Hopwood et al. 2012). Do not employ the use of neonicotinoids on IDFG administered lands (Hopwood et al. 2012).	Western Bumble Bee, Suckley Cuckoo Bumble Bee

Habitat loss

Pollinators require foraging and nesting habitat. Providing both types of habitat within close proximity to each other is the best way to ensure pollinator success. Protecting, enhancing, and creating pollinator habitat can be a fun and rewarding way to engage with local communities. Educating land managers about techniques to reduce land management impacts to pollinators is an essential component to pollinator habitat management.

Objective	Strategy	Recommended Action(s)	Target SGCNs
Reduce impact of land management practices on pollinators (Mader et al. 2011).	Educate about and implement practices which benefit pollinators. (Mader et al. 2011).	Reduce grazing impacts by limiting grazing to one third to one fourth of management areas per season (Mader et al. 2011). Implement pollinator beneficial mowing techniques including use of flushing bar, cutting at ≤8 mph, maintaining a high minimum cutting height of ≥12–16 inches, mowing only in daylight hours, mow in a mosaic instead of an entire site (Mader et al. 2011). Where prescribe fire is used implement pollinator friendly burning protocols including rotational burning of ≤30% of each site every few years, leave small unburned patched intact, avoid burning too frequently (no more than every 5–10 years), avoid high intensity fires unless the burn goal is tree removal. Work with Idaho Department of Transportation to implement proper roadside pollinator habitat management (Mader et al. 2011).	Western Bumble Bee, Suckley Cuckoo Bumble Bee, Monarch
Conserve existing pollinator habitat.		Map existing major known pollinator habitat. Identify and recognize landowners providing pollinator habitat and provide habitat management educational opportunity (Mader et al. 2011). Conduct surveys for native milkweed. Initiate seed saving program (Mader et al. 2011).	Western Bumble Bee, Suckley Cuckoo Bumble Bee, Monarch
Create new urban and rural pollinator habitat.	Develop programs to encourage urban landowners to	Provide pollinator habitat workshops for homeowners and rural land owners. Provide other educational materials for	Western Bumble Bee, Suckley Cuckoo Bumble Bee, Monarch

Objective	Strategy	Recommended Action(s)	Target SGCNs
	create pollinator habitat.	homeowners. Provide an incentive program for homeowners to create pollinator habitat in urban yards. Convert majority of lawn at Coeur d'Alene IDFG regional office to pollinator habitat. Work with municipalities and businesses to create urban pollinator habitat. Provide bee nest boxes for purchase at the Coeur d; Alene IDFG regional office.	

Climate planning and monitoring

Delineating temperature refugium for cool water or air temperature dependent species is a relatively new idea (Isaak et al. 2015). Recent micro-climate monitoring work in the Idaho Panhandle identified within the Flathead Valley pockets of annually cool air (Lucid et al. 2015). Continued monitoring of micro-climate along with co-occurrence of cool air dependent organisms will provide bedrock information for research determining best management practices for cool air associated species.

Objective	Strategy	Recommended Action(s)	Target SGCNs
Climate monitoring	Monitor climate variables and species co-occurrence over time	Develop climate monitoring program using a variety of micro-climate variables along with co-occurrence of associated SGCN.	Western Bumble Bee, Suckley Cuckoo Bumble Bee, Gillette's Checkerspot

Species designation, planning and monitoring

Actions to enhance pollinator habitat will be most effective with knowledge of the current status of SGCN populations. Initiation of long term monitoring will allow a continuous data stream to assess conservation activities. Gillette's Checkerspot occurs in locally abundant colonies (Williams et al. 1984). Specific surveys for this species are required to map distribution. Known occupied sites should be managed to minimize disturbance.

Objective	Strategy	Recommended Action(s)	Target SGCNs
Determine pollinator population status	Conduct surveys and implement long term pollinator monitoring program.	Conduct surveys to identify colonies and breeding locations of bee SGCN. Conduct specific surveys for Gillette's Checkerspot. Protect known breeding sites. Incorporate pollinator monitoring into regional multitaxa monitoring efforts.	Western Bumble Bee, Suckley Cuckoo Bumble Bee, Gillette's Checkerspot, Monarch

Flathead Valley Section Team

An initial summary version of the Flathead Valley Ecological Section project plan was completed for the 2005 Idaho State Wildlife Action Plan. A small working group developed an initial draft of the Section Plan (Miradi v 0.7 which was then reviewed by a much wider group of stakeholders at a 2-day meeting held at the Idaho Department of Fish and Game in February 2015 (this input captured in Miradi v 0.9). This draft was then subsequently revised. Materials in this document are based on Miradi v. 0.16. Individuals and organizations/agencies involved in this plan are shown in Table 2.3.

Table 2.3 Individuals, agencies, and organizations involved in developing this plan[a]

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[a] Apologies for any inadvertent omissions.
[b] An asterisk "*" denotes team leader(s) and contact point if you would like to become involved in this work.

Literature Cited

See Okanogan Highlands Section